THE programme of day and evening classes at the Woolwich Polytechnic during the session 1907–8 has been received. The volume contains the usual syllabuses of subjects studied at the polytechnic, and particulars of the examination requirements of London University, Board of Education, and other examining bodies. We are glad to see here and there short notes as to the value of preliminary scientific education to the student of technology. Thus, it is pointed out that a sound knowledge of mathematics is the surest basis for satisfactory progress in mechanical and physical science. In the physical department, all students are required to attend both the lecture and the laboratory course in each class; and students of electrical engineering must attend classes in electricity and magnetism concurrently if they have no knowledge of the principles of electrical science. Systematic courses of study extending over three or more years are arranged in various branches of technology; and the time-tables of these courses should be useful as a guide to serious students. We notice the announcement that the governors are desirous that no young man or woman shall be deprived of the advantages of the instruction given in the polytechnic, on the ground of inability to pay the fees. The principal is authorised to admit students free who desire to attend any of the classes and to work steadily, but are unable to pay the necessary fees.

THE distribution of medals, prizes, and certificates to students of the Royal College of Science on Thursday last was made the occasion of several references to the charter of incorporation of the Imperial College of Science and Technology. The Dean, Prof. W. A. Tilden, trusts that by the end of the year everything will be ready for the transfer of authority which is to take place from the Board of Education to the governing body of the Imperial College on January 1 next. In his address to the students, Mr. A. H. D. Acland said that in the forwarding of technology this country has been lamentably backward. Scientific knowledge is at the very root of the prosperity of the Empire. If determined efforts are made a great national institution will be established of which the country will really be proud. Mr. Acland advised the students to do something to study the great masterpieces of the English language. He remarked that in later life, when they have to make reports, as all men in scientific life must do, they will often find that the study of the English language will not have been altogether useless, even at the present stage of their education. Mr. Acland also advised the students to travel when it is possible for them to do so. Scientific men do a great deal by their interchange of ideas between this and foreign countries to forward that which we all desire—international friendliness. Prof. Dalby, Dean of the Central Technical College of the City and Guilds of London Institute, referred to the union which is to take place between the three colleges; and Sir William White said that to put the charter in practical form it is necessary to recognise all that has been done in the past, to utilise fully all that exists, and to bring the whole of the higher technical instruction into one harmonious and sympathetic working whole.

A STRONG plea for the establishment of a university for Bristol and the West of England was made by Prof. F. Gotch, F.R.S., at the annual distribution of prizes to the students of the faculty of medicine of the University College of that city on October 1. Prof. Gotch pointed out that the geographical position of Bristol, her civic prosperity, and her educational institutions are such that there is no excuse for further delay. It is time for the city to realise that in higher education the organisation of her teaching resources is a matter of momentous importance, and that the way to attain this is to segregate all her scattered educational efforts in a university. Surely the citizens of Bristol are as enlightened and generous as those of Liverpool, Manchester, Birmingham, Leeds, and Sheffield; and the fact that the city has not also a university of its own must be because the difference between a college and a university is not understood. A university possesses greater educational stability, and, in consequence, greater educational efficiency. It segregates all the higher educational enterprises of the district, rivalry gives place to cooperation, general interest is thus awakened, and it is sustained by the knowledge that, having become a working partner in a great enterprise, it must at all hazards be made a success. The credit of the community is then at stake, thus ensuring its proper support; and since the enterprise has, from the educational point of view, attained a new level, it is viewed from a different and a higher standpoint. Another conspicuous feature of a university is the freedom which it enjoys. The possession of the power to give a degree carries with it a matter of enormous freedom. Collegiate teaching has to follow along lines prescribed by those bodies which give degrees, and such prescription stifles educational development, because the teacher has no voice in the matter. A further feature of a local university is the enlargement of the area of educational responsibility. The pride which the citizens of Liverpool and Birmingham have in their universities is due to their proprietary interest in them. A university would thus become the dominant educational force and pride of Bristol and all the surrounding district. The last feature of a university, as distinct from a college, is one which will in the end carry on its broad back all the others: it is prestige. So long as Bristol only possesses a college, she will from the standpoint of higher education have but little general prestige. The fault does not lie with the character of the collegiate teaching, the size of the buildings, or the equipment of the scientific laboratories. So long as the college continues to remain in its present condition, so long will it not only gain no prestige, but may begin to lose what prestige it now possesses. Those who take over wider university responsibilities are felt to be possessed by the spirit of the age, and are duly honoured, whilst those who hesitate to do so are felt to be without this spirit, and lose their position.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, received June 8.—"On Luminous Efficiency and the Mechanical Equivalent of Light." By Dr. Charles V. **Drysdale**. Communicated by Prof. Silvanus P. Thompson, F.R.S.

The paper first directs attention to the fact that the term luminous efficiency requires more rigorous definition. If Q is the total power consumption of the source, R the total radiation $= \int_0^\infty I_\lambda d\lambda$, and L the luminous radiation $= \int_{\lambda_1}^{\lambda_2} I_\lambda d\lambda$, the luminous efficiency is generally taken to mean the ratio L/Q. In many cases, however, the ratio L/R, which has been termed by Nichols the radiant efficiency, is determined. Neither of these definitions is entirely satisfactory from the practical point of view, as a source might apparently be of high efficiency if its radiation were confined within the visible spectrum, but near to either end of the spectrum, where the luminosity is low. A better definition is that of Dr. Guilleaume, which may be termed the reduced luminous efficiency L_λ/Q, where L_λ is the equivalent radiation of the most effective form required to give the same light emission. In order to obtain the latter quantity it is necessary to determine the mechanical equivalent of the most effective luminous radiation which is in the neighbourhood of $\lambda = 0{\cdot}54\ \mu$.

For the measurement of the mechanical equivalent a spectrum was formed by a carbon bisulphide prism, and a combined photometric and bolometric arrangement was made to enable the luminosity of any part of the spectrum to be measured, and the radiation to be compared with that from a glow lamp radiating a known amount of power. By means of a movable screen the radiation from the spectrum or from the source of radiation could be intercepted alternately, and the radiation from the comparison source altered until no effect was observed on

changing from the spectrum to the comparison lamp. This eliminated trouble due to drift. Measurements were made both with approximately monochromatic light in the neighbourhood of 0·54 μ, and in white light obtained by widening the slit until the whole of the light within the visible limits was collected at the bolometer. The result obtained for the mechanical equivalent was 0·06 watt per candle for the yellow-green light; for white light obtained from an arc the mechanical equivalent was 0·08 watt per candle, and from a Nernst filament as source 0·12 watt per candle, the latter result agreeing almost exactly with that obtained by Ångström for the light of the Hefner lamp. The ideal source of white light should therefore give somewhere about ten candles per watt, and a monochromatic yellow-green source nearly seventeen candles per watt.

June 13.—"On the Identification of Chitin by its Physical Constants." By Miss I. B. J. **Sollas.** Communicated by Prof. W. J. Sollas, F.R.S.

The determination of the physical constants of chitin forms a useful method of identifying it. The specific gravity of chitin from various sources approximates to the value 1·398, a number which represents the specific gravity of chitin precipitated from its solution in strong acid. The refractive index lies between the limits 1·550 and 1·557.

The bristles of Lumbricus, the pupal skin of Pieris and other Lepidoptera, the radula of Mollusca and the shell of Sepia, when freed from mineral matter and easily soluble organic substances, have specific gravities and refractive indices which lie between the same limits as those of chitin from various sources.

June 27.—"The Pressure of Bile Secretion and the Mechanism of Bile Absorption in Obstruction of the Bile Duct." By Dr. Percy T. **Herring** and Dr. Sutherland **Simpson.**

The authors find that the maximum pressure attained by the bile in obstruction of the common bile duct considerably exceeds the figures given by Heidenhain. In the dog, cat, and monkey the average maximum pressure reached in a number of experiments was 300 mm., measured in terms of the height of a vertical column of bile. The highest pressure recorded was 373 mm. bile in a cat.

When the common bile duct is obstructed the bile escapes from the liver by the lymphatics, and in the cat may be seen in the thoracic duct one hour after obstruction.

Evidence is adduced to show that the obstructed bile enters the intracellular plasmatic channels of the liver cells, and passes from them by the natural lymph flow into the lymph channels of the portal spaces. The mechanism of absorption lies in the liver cells, and is not an escape from interlobular bile ducts.

The intracellular plasmatic channels are held to constitute an intermediate system between the blood-vessels and lymphatics of the liver. The "vital" theory of lymph formation is supported.

"On the Relation between the Output of Uric Acid and the Rate of Heat Production in the Body." By E. P. **Cathcart** and J. B. **Leathes.** Communicated by Dr. C. J. Martin, F.R.S.

A diet containing no purine bases, free or combined, was taken by one of the experimenters in equal amounts every three hours during the day, and the output of uric acid during each of the periods of three hours was determined. In this way the average rate of excretion for each period of the day could be ascertained, as well as the daily total. Exposure to cold for about three hours with no voluntary muscular exertions increased the rate of excretion at the time and for some time after (in the first twenty-four hours nearly 50 per cent. above the mean calculated from sixteen successive days), whereas a similar exposure to cold counteracted by muscular activity increased it much less (in the first twenty-four hours about 15 per cent.), and muscular activity without the stimulus of cold (in heavy clothing) for the same length of time diminished it (in the first twenty-four hours about 30 per cent.). The conclusion pointed to is that the endogenous uric acid is in part, and it may be to a considerable extent, a product of the reaction of the body to loss of heat, and that this reaction consists in some form of activity distinct from voluntary movements of the muscles.

"Further Studies of Gastrotoxic Serum." By Dr. Charles **Bolton.** Communicated by Prof. S. Martin, F.R.S.

The serum referred to in this communication was prepared by injecting the stomach cells of the guinea-pig into the rabbit, the blood serum of the rabbit developing toxic properties for the guinea-pig's tissues.

It has been shown that the serum contains, not only a precipitin for stomach-cell proteid, but also separate precipitins for other body proteids. The actions of these precipitins overlap to some extent. There is no agglutinin for the stomach-cell granules, the agglutination which was found to occur being brought about by the precipitins.

The repeated injection of gastrotoxic serum does not produce chronic gastric ulceration, but immunity to the serum is established. The immunity is not only active, but the serum is able to confer passive immunity upon another animal. The tissues of the immune animal are still acted upon by the gastrotoxic serum in the test-tube, the immune substances being present in the blood serum of the animal.

It has been demonstrated that the necrosis of the mucous membrane of the stomach resulting from the injection of gastrotoxic serum is not directly caused by the serum, but is brought about directly by the action of the gastric juice. The cells are functionally damaged by the serum, which renders them susceptible to the gastric juice. The process is thus one of self-digestion. Hyperacidity of the gastric juice increases the tendency to this self-digestion.

Received July 20.—"A Preliminary Summary of the Results of the Experimental Treatment of Trypanosomiasis in Rats." By H. G. **Plimmer** and J. D. **Thomson.** Communicated by Sir Ray Lankester, K.C.B., F.R.S.

The experiments described were undertaken under the direction of the Tropical Diseases Committee of the Royal Society.

The strains of trypanosomes used were a nagana from the original strain brought to England, and a surra from Prof. Lingard in India. The nagana strain kills rats in an average time of 5·5 days, and the surra strain in 6·9 days.

Of drugs experimented with, fifteen chinolin compounds, dichlorobenzidine + acidH, trypanroth, arsenious acid, atoxyl, monophenylarsenic acid, nitrophenylarsenic acid, paratolylarsenic acid, and other arsenic compounds are commented upon, and their effects on the development and course of the diseases stated. Of all the arsenic compounds, and, indeed, of all substances tried singly, atoxyl had by far the most favourable action.

This is the most important substance, so far discovered, in relation to the treatment of trypanosomiasis. In nagana and surra atoxyl causes the entire disappearance of the trypanosomes from the blood, so that rats inoculated with the blood when it was microscopically free from parasites failed to take the disease; but the trypanosomes have invariably recurred, and death was only delayed for a period varying with the dose, and with the time of commencement of the treatment.

When atoxyl is given more continuously or more freely than is required, in cases in which there have been many recurrences, and probably under some other conditions of which we are ignorant, in a certain small proportion of rats so treated a race of trypanosomes is produced which entirely resists atoxyl, and continues to develop and multiply in spite of continued exhibition of the drug. This strain, when inoculated into fresh rats, retains its resistance to atoxyl. Ehrlich, who has produced such a strain in mice, calls them "atoxyl-fest," and we have obtained this atoxyl-proof variety of trypanosome in rats, both in nagana and surra.

In human trypanosomiasis the danger of the production of an atoxyl-proof strain will be at once apparent. For an account of the production and behaviour of these atoxyl-

proof strains, and for the results obtained with them, reference must be made to the original paper. Their importance and their bearing on the treatment of human trypanosomiasis by atoxyl is obvious.

Under the heading "Treatment with two or more Drugs," a number of tables are given showing the results of treatment with atoxyl and various mercury compounds, and atoxyl and iodipin. Of the mercury compounds used, the succinimide appears to be the best; it has the great advantage of being unirritating to the tissues, and it will mix with atoxyl without precipitation, and without interfering with the action of the latter.

The results with atoxyl and iodipin are sufficiently encouraging to suggest a further trial of this combination. Several of the animals treated are alive, and apparently well, some as long as five months after inoculation; the duration of the disease has been very greatly prolonged in the great majority of cases, and in some the authors have confidence that a cure has been effected.

PARIS.

Academy of Sciences, September 30.—M. Henri Becquerel in the chair.—Is the use of arsenious acid a preventative against trypanosomiasis? **A. Laveran** and A. **Thiroux.** The authors have repeated the experimental work of Loeffler and Ruhs, and come to the conclusion that the use of arsenious acid for trypanosomiasis is not advisable, although in certain cases it may have a useful effect. It cannot be used like quinine against malaria, as the necessary doses of quinine in the latter case are small, not toxic, and can be administered without inconvenience during several months, whilst the doses of arsenious acid which must be administered, either in man or in animals, judging from the doses necessary with the guinea-pig, would be quickly followed by poisonous symptoms. In animals used for food, in particular, the prolonged use of arsenic would have the result of rendering the flesh poisonous.—Researches on the laws of action of light on glucosides, enzymes, toxins, and anti-bodies: Georges **Dreyer** and Olav **Hanssen.** The authors have examined the action of light on two glucosides, saponine and cyclamine; three enzymes, yeast, trypsine, and papayotine; two toxins, ricine and abrine; and one immuno-serum, coli-agglutinine. All these are weakened by the action of light, the ultra-violet rays retained by glass being the chief cause. The action progresses regularly under the action of continuous lighting, the change following very exactly the law of monomolecular reaction.—Transformers with magnetic leakage and secondary resonance for wireless telegraphy: MM. **Gaiffe** and **Gunther.**—Observations on the affinities and evolution of the Chicoraceæ: Léon **Dufour.**—The pluricarpellary origin of the pistil in the Lauraceæ: Marcel **Mirande.**—The function of the spleen in trypanosomiasis: A. **Massaglia.** Trypanosomes collected from the spleen present the same characters as those collected from other parts of the body. This virulence of the trypanosome does not disappear more rapidly in the spleen of animals killed by the trypanosome than in the blood of these animals, and the extract of the spleen does not destroy, *in vitro*, the trypanosomes. The course of the disease surra is the same in a dog from which the spleen has been removed as in the normal animal.—Researches on the chemical nature of the fundamental colouring material of the urine: S. **Dombrowski.** The urochrome is isolated from the urine by precipitation with copper acetate, and from its analysis is shown to contain carbon, hydrogen, nitrogen, sulphur, and oxygen. The sulphur is easily removed by alkalis; the presence of sulphur shows that this body is not derived from the coloured part of hæmoglobin or urobilin, as has been asserted up to the present.—Sodium chloride as a sensitising substance for vegetable ferments: C. **Gerber** and Mlle. S. **Ledebt.** Sodium chloride, in small proportions, accelerates the coagulation of milk by vegetable ferments. It determines the phenomenon when the ferment is present in too small quantities to act alone.

NEW SOUTH WALES.

Linnean Society, August 28.—Mr. A. H. Lucas, president, in the chair.—A preliminary record of the occurrence of Chlamydoselachus in the waters of New South Wales: D. G. **Stead.** The record was based upon portions of a specimen cast ashore some time since in Rose Bay, Port Jackson, comprising the skull and about 150 vertebræ. The specimen measured more than 10 feet in length. Only one species of the genus is known, *C. anguineus*, Garman, from the Sea of Sagami, Japan, as well as from deep waters in the vicinity of Madeira, the Azores, and the coast of Norway, while the length of the largest specimens hitherto known appeared to be about 5 feet.—The resistance of the vegetation of Australia to bush-fires, and the antiquity of the Australian aboriginal: Dr. J. B. **Cleland.** The object of the paper is to suggest that, if it can be proved that the vegetation of Australia has been modified in the course of ages so as to have become more tolerant of bush-fires, and as a result of the frequency of such fires, and if the frequency of such fires can be regarded as due mainly to the agency of man, then there would seem to be some grounds for attributing considerable antiquity to the presence of fire-producing man in that region, and therefore, presumably, to the ancestors of the vanishing aboriginal Australian.—The geology of the Warrumbungle Mountains, N.S.W.: H. I. **Jensen.** In this paper the physiography of the Warrumbungle Mountains district is described, and it is shown that many of its peculiarities are due to *arid erosion*. The mountains may be looked upon as forming a dissected lava conoplain surrounded by an arid erosion peneplain.

CONTENTS.

SUPPLEMENT.